



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/617,912	07/11/2003	Mark D. Fokema	26048-013	4220

30623 7590 03/08/2006

MINTZ, LEVIN, COHN, FERRIS, GLOVSKY  
AND POPEO, P.C.  
ONE FINANCIAL CENTER  
BOSTON, MA 02111

EXAMINER
----------

GRIFFIN, WALTER DEAN

ART UNIT	PAPER NUMBER
----------	--------------

1764

DATE MAILED: 03/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/617,912

**Applicant(s)**

FOKEMA ET AL.

**Examiner**

Walter D. Griffin

**Art Unit**

1764

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) 35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Election/Restrictions*

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-34, drawn to a process for removing sulfur from a hydrocarbon fuel, classified in class 208, subclass 303.
- II. Claim 35, drawn to an absorbent composition, classified in class 502, subclass 400.

The inventions are distinct, each from the other because of the following reasons:

Inventions of Group II and Group I are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product. See MPEP § 806.05(h). In the instant case, the product as claimed can be used in a materially different process such as hydrotreating.

Because these inventions are independent or distinct for the reasons given above and have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Robert Sayre on February 2, 2006 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-34. Affirmation of this election must be made by applicant in replying to this Office action. Claim 35 is

Art Unit: 1764

withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

#### ***Correction of Inventorship***

The request to correct the inventorship of this nonprovisional application under 37 CFR 1.48(a) is deficient because an oath or declaration by each actual inventor or inventors listing the entire inventive entity has not been submitted.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5 is indefinite because the expression “the reaction product” lacks proper antecedent basis in claim 1.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 12, 13, 14, 16, and 24-32 are rejected under 35 U.S.C. 102(b) as being anticipated by Khare (US 6,184,176 B1).

The Khare reference discloses the desulfurization of a hydrocarbon stream such as gasoline or diesel fuel. These streams contain sulfur compounds such as alkyldibenzothiophenes. The process comprises contacting the hydrocarbon stream with a sulfur compound sorbent comprising an active metal oxide (e.g., zinc oxide) at temperatures ranging between 100° and 1000°F (38° to 538°C) and at preferred pressures ranging from 50 to 500 psi (345 kPa to 3.4 MPa). It is preferred that the contacting be carried out in the presence of hydrogen. Since this is a preferred embodiment, hydrogen does not need to be present in the process during the contacting. After the contacting stage, the adsorbent is regenerated by contacting the adsorbent with oxygen-containing gases such as air at preferred temperatures ranging from 800° to 1200°F (427° to 649°C). Example II discloses feeds with sulfur amounts within the claimed range. See column 3, lines 16-30 and 59-67; column 6, line 59 through column 7, line 45; and column 8, line 66 through column 9, line 8.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 2, 3, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Khare (US 6,184,176 B1) in view of WO 02/22763.

The Khare reference discloses the desulfurization of a hydrocarbon stream such as gasoline or diesel fuel. These streams contain sulfur compounds such as alkyldibenzothiophenes. The process comprises contacting the hydrocarbon stream with a sulfur compound sorbent comprising an active metal oxide (e.g., zinc oxide) at temperatures ranging between 100° and 1000°F (38° to 538°C) and at preferred pressures ranging from 50 to 500 psi (345 kPa to 3.4

Art Unit: 1764

MPa). It is preferred that the contacting be carried out in the presence of hydrogen. Since this is a preferred embodiment, hydrogen does not need to be present in the process during the contacting. After the contacting stage, the adsorbent is regenerated by contacting the adsorbent with oxygen-containing gases such as air at preferred temperatures ranging from 800° to 1200°F (427° to 649°C). Example II discloses feeds with sulfur amounts within the claimed range. See column 3, lines 16-30 and 59-67; column 6, line 59 through column 7, line 45; and column 8, line 66 through column 9, line 8.

The Khare reference does not disclose the contacting of the hydrocarbon with an acidic inorganic material as claimed to effect reduction of the average molecular weight of the fuel and produce hydrogen sulfide.

The WO reference discloses a process for the removal of sulfur from hydrocarbon fuels by contacting the fuels with a metal oxide sorbent mixed with a cracking catalyst such as a catalyst comprising a zeolite. See entire document, especially pages 12 and 18.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Khare by including a cracking catalyst in the contacting step as suggested by the WO reference because the cracking results in the production of valuable products.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Khare (US 6,184,176 B1) in view of WO 02/22763 as applied to claim 3 above, and further in view of Chen et al. (US 4,911,823).

The previously discussed references do not disclose the use of a mixture of zeolite beta and ZSM-5 as the acidic inorganic material.

Art Unit: 1764

The Chen reference discloses that a mixture of zeolite beta and ZSM-5 is effective in cracking hydrocarbons. See column 8, lines 23-28.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the teachings of the previously discussed references by using a mixture of zeolite beta and ZSM-5 as the cracking component as suggested by Chen because octane number of the product will be improved.

Claims 5, 6, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Khare (US 6,184,176 B1).

The Khare reference discloses the desulfurization of a hydrocarbon stream such as gasoline or diesel fuel. These streams contain sulfur compounds such as alkyldibenzothiophenes. The process comprises contacting the hydrocarbon stream with a sulfur compound sorbent comprising an active metal oxide (e.g., zinc oxide) at temperatures ranging between 100° and 1000°F (38° to 538°C) and at preferred pressures ranging from 50 to 500 psi (345 kPa to 3.4 MPa). It is preferred that the contacting be carried out in the presence of hydrogen. Since this is a preferred embodiment, hydrogen does not need to be present in the process during the contacting. After the contacting stage, the adsorbent is regenerated by contacting the adsorbent with oxygen-containing gases such as air at preferred temperatures ranging from 800° to 1200°F (427° to 649°C). Example II discloses feeds with sulfur amounts within the claimed range. See column 3, lines 16-30 and 59-67; column 6, line 59 through column 7, line 45; and column 8, line 66 through column 9, line 8.

The Khare reference does not disclose a step of separating the product from the contacting step into a higher boiling fraction and a lower boiling fraction and does not disclose



Art Unit: 1764

the recycling of the higher boiling fraction or the combusting of the higher boiling fraction to provide heat for the process.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process Khare by separating as claimed because separating hydrocarbons is a conventional step and one would separate in order to obtain desired fractions.

It also would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Khare by recycling any fraction to the desulfurization step because recycling would result in a product having lower amounts of sulfur.

It also would have been obvious to one having ordinary skill in the art at the time the invention was made to have combusted any product from the process to provide heat because the product from the process is a fuel and the process is conducted at elevated temperatures. Therefore, using the fuel from the process to provide heat for the process eliminates the need for an outside source of fuel thereby improving the economics of the process.

Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Khare (US 6,184,176 B1) as applied to claim 5 above, and further in view of Michlmayr (US 4,179,361).

As discussed above, the Khare reference does not disclose the use of a secondary desulfurization agent.

The Michlmayr reference discloses a two-stage adsorption process for desulfurizing oil feed containing thiophenes. See column 3, lines 5-25.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Khare by including a second adsorption step

Art Unit: 1764

as suggested by Michlmayr because sulfur impurities will be further removed resulting in a purer product.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Khare (US 6,184,176 B1) in view of Michlmayr (US 4,179,361) as applied to claim 8 above, and further in view of WO 02/22763 A1.

The previously discussed references do not the desulfurization agent of claim 9.

The WO reference discloses sorbents that contain zinc oxide, copper, and alumina. See page 18.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the teachings of the previously applied references by using the sorbent of the WO reference because these sorbents are effective for sulfur removal and therefore would be expected to be effective in the prior art process.

Claims 17-23, 33, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Khare (US 6,184,176 B1) in view of Eberly, Jr. et al. (US 4,464,252).

As discussed above, the Khare reference does not disclose the use of a molybdenum-containing sorbent.

The Eberly reference discloses a process for removing sulfur from a hydrocarbon by using a sorbent containing  $\text{MoO}_3$  on alumina. The sorbent is used in a process at temperature within the claimed range and without hydrogen. See column 2, lines 40-59; column 3, lines 6-43; and claim 1.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Khare by using a molybdenum-containing

Art Unit: 1764

sorbent as suggested by Eberly because such sorbents are effective for removing sulfur from hydrocarbons at the conditions disclosed by Khare. Regarding the amounts of components in the sorbent and other characteristics of the sorbent, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have used sorbents having the claimed characteristics because one would adjust such characteristics to provide the most effective sorbent for removal of sulfur.

### *Conclusion*

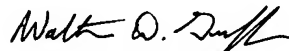
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art not relied upon discloses sulfur removal processes.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter D. Griffin whose telephone number is (571) 272-1447. The examiner can normally be reached on M-F 6:30 to 4:00 with alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1764

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Walter D. Griffin  
Primary Examiner  
Art Unit 1764

WG  
March 3, 2006